

Status of the Radial Schrodinger Equation

Teimuraz Nadareishvili^a

Anzor Khelashvili^b

Email: teimuraz.nadareishvili@tsu.ge

^a Faculty of Exact and Natural Sciences Department of Physics.

Iv. Javakhishvili Tbilisi State University Chavchavadze Ave. 3

Inst. of High Energy Physics, Iv. Javakhishvili Tbilisi State University, University Str. 9

^b Inst. of High Energy Physics, Iv. Javakhishvili Tbilisi State University, University Str. 9

Annotation (Resume)

It was revealed by us, that during full history of quantum mechanics the extra delta-function term was unnoted in the radial Schrodinger equation. Namely, in course of transition to the pure second order radial equation from the full radial equation, which is very common procedure in the problems with central potentials, there appears "extra" delta-function. We have studied this problem carefully and have shown that the derivation of radial equation, that is consistent with the full Schrodinger equation may be achieved if and only if the certain boundary constraint at the origin is to be required. We cleared up also that this constraint is valid only for regular potentials.

As regards of singular potentials the traditional radial equation doesn't take place and the results, obtained earlier on the basis of this equation for singular potentials have only mathematical interest and have nothing with physics. Regular formulation of physical problems for singular potentials is permissible only in the framework of full radial equation.

References

- [1] A. Khelashvili and T. Nadareishvili. "Delta-like Singularity in the Radial Laplace Operator and the Status of the Radial Schrodinger Equation". Bulletin of the Georgian National Academy of aSciences (Moambe), 6 (2012) 68.
- [2] T. Nadareishvili and A. Khelashvili. "Self-Adjoint Extension procedure in the Nonrelativistic Quantum Mechanics". Georgian Electronic Scientific Journal (GESJ):Physics., No2(8), (2012) 81.
- [3] T. Nadareishvili and A. Khelashvili. "Pragmatic SAE procedure in the Schrodinger equation for the inverse-square-like potentials". <http://arxiv.org/abs/1209.2864>. Is Submitted in the "Brazilian Journal of Physics" for publication.
- [4]. A. Khelashvili and T. Nadareishvili, "What is the boundary condition for the radial wave function of the Schrodinger equation?" Am.J.Phys.,79 (2011)668.